

# Egg laying by thorny devils (*Moloch horridus*) under natural conditions in the Great Victoria Desert

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Manuscript received March 1996; accepted June 1996

## Abstract

Three female *Moloch horridus* were recorded in the Great Victoria Desert of Western Australia digging a nesting chamber and laying eggs, in September, October and November, 1995. Two clutches, containing six and seven eggs, hatched after 123–127 days. Ambient temperature in the excavated nesting chamber after hatching was approximately 31 °C. Clutch masses were estimated to be 34.2, 40.9 and 41.7% of the total body mass of the female. The mean mass of neonates was 1.8 g; their mean snout-to-vent (SVL) was 35.7 mm, and their mean total length was 63.8 mm. Neonate *M. horridus* appear to eat their egg shells before digging their way out of the nest chamber. Other published data on egg laying by *M. horridus* are also reviewed.

## Introduction

A radiotelemetric study of the movements of *Moloch horridus* was undertaken from mid-September through to early November, 1995. During the course of this study, we were fortunate to observe three gravid females excavate their nest chambers and oviposit. We thus obtained valuable information on pre- and post-oviposition body mass for these three females, allowing estimation of relative clutch mass (RCM). Moreover, two of these nests were monitored over a four month period until hatchlings emerged, and the two nest chambers were excavated.

## Methods

*Moloch horridus* were located by following their spoor in the sandy soil of the Great Victoria Desert (28° 28' S, 123° 36' E). Transmitters were attached to six female and three male *M. horridus*. Lizards were weighed, measured and assigned an alphabetic character from M through U for identification (Table 1). Three adult females, O, P and T, did not lay eggs during the period of observation; N, Q and U did lay eggs. A covered wire enclosure (10 mm galvanised mesh) about 1.5 m in diameter was erected around two of the nests to protect the eggs from predators and to capture the hatchlings when they emerged. A drift fence of flyscreen folded over inwards at the top was erected about a metre outside the covered enclosure to ensure that hatchlings did not escape. The late oviposition date for female U meant that the neonates could not be measured when they hatched, as study at the site would cease in February, as a consequence this nest was not fenced off from predators.

## Results and Discussion

Female N, the largest thorny devil which was captured on 16 September, spent three days digging its nesting burrow (Figure 1) at the southern base of a sandridge, and laid its eggs on 19 September, after which it backfilled the nest burrow the next day. The RCM of this female was 34.2% (Table 2). Its post-oviposition mass was 37.5 g and its final mass at the end of the study on 8 November, was 46.5 g; which is a mass gain of 9 g in 50 days or an increase of about 0.5% per day on its post-oviposition body mass. The neonates emerged on 20 and 21 January. The nesting burrow was excavated on 24 January and there were no eggshells in the chamber. The nest chamber (filled with air at 31 °C) was approximately 90 mm high by 120 mm wide and about 150 mm long. The ceiling of this chamber was about 220 mm below ground surface. Hatchlings dug a sloping tunnel through hard-packed sand and emerged at the surface about 300 mm from the nest chamber. They did not dig out through the entrance that had been back-filled by the female. All seven neonates (Figure 2) emerged from the nest through a hole which was about 20 mm in diameter.

Table 1

Dates, sex, size and mass of *Moloch horridus* monitored.

| ID | Date of capture | Sex    | SVL (mm) | Mass (g) at capture | Mass (g) on 8 November, 1995 |
|----|-----------------|--------|----------|---------------------|------------------------------|
| M  | 14 Sept.        | Male   | 82       | 33.0                | (Lost 6 Oct)                 |
| N  | 16 Sept.        | Female | 105      | 57.0                | 46.5                         |
| O  | 20 Sept.        | Female | 88       | 38.9                | 49.5                         |
| P  | 27 Sept.        | Female | 85       | 28.5                | ---                          |
| Q  | 27 Sept.        | Female | 87       | 52.0                | 42.5                         |
| R  | 28 Sept.        | Male   | 76       | 28.5                | 30.0                         |
| S  | 4 Oct.          | Male   | 78       | 32.3                | (Lost 12 Oct)                |
| T  | 5 Oct.          | Female | 90       | 51.0                | 48.5                         |
| U  | 7 Nov.          | Female | 87       | 55.0                | 32.5                         |



Figure 1. Female *Moloch horridus* at the opening of its burrow to the nesting chamber.



Figure 2. Seven neonate *Moloch horridus* shown in hand to indicate their size.

Female Q was captured on 26 September, fitted with a transmitter and released on 27 September. It moved approximately 70 m south over a sandridge and spent several days in early October, digging a nesting burrow into the southern slope of the dune. It laid eggs on 3 October, and backfilled the nest burrow on the same day. The

RCM for female Q was 41.7% (Table 2). The nesting burrow was excavated one day after the neonates emerged (8 February). The nest chamber (filled with air at 30.8 °C) was approximately 80 mm high by 120 mm wide and about 120 mm long. The ceiling of this nesting chamber was about 200 mm below ground surface. Again, the



Table 2

Clutch mass, incubation period and neonate size for *Moloch horridus*.

| Parameter  | Female N      | Female Q      | Female U |
|--|---------------|---------------|----------|
| Date of egg laying                               | 19 Sept.      | 3 Oct.        | 12 Nov.  |
| Pre-oviposition body mass (g)                    | 57            | 52            | 55       |
| Post-oviposition body mass (g)                   | 37.5          | 30.3          | 32.5     |
| Clutch mass (g)                                  | 19.5          | 21.7          | 22.5     |
| Relative clutch mass (%)                         | 34.2          | 41.7          | 40.9     |
| Hatch date(s)                                    | 20-21 Jan.    | 7 Feb.        |          |
| Incubation period (days)                         | 123 - 124     | 127           |          |
| Number of hatchlings                             | 7             | 6             |          |
| Mean ( $\pm$ SE) mass of hatchlings (g)          | 1.76 (0.037)  | 1.9 (0.026)   |          |
| Mean ( $\pm$ SE) SVL of hatchlings (mm)          | 35.29 (0.360) | 36.17 (0.167) |          |
| Mean ( $\pm$ SE) total length of hatchlings (mm) | 62.86 (0.738) | 64.83 (0.401) |          |
| Total body mass of all hatchlings (g)            | 12.3          | 11.4          |          |
| Mass lost during incubation (g)                  | 7.2           | 10.3          |          |

neonates dug a single sloping tunnel to the surface by which all six exited. These neonates did not dig out of the nesting chamber via the entrance backfilled by the female. Again no eggshells were found in this chamber.

The nest burrow of female U was located at the southern base of the same sandridge as those of females N and Q. Female U laid its eggs and backfilled the burrow to its nest chamber on 12-13 November. The RCM for female U was 40.9% (Table 2). When checked on 10 December, this nest had been excavated and predated, probably by a *Varanus gouldii*. However, if incubation time was similar to those of females N and Q, the eggs of female U would not have hatched until mid-March.

There are limited data on oviposition and incubation for *M. horridus* in captivity (White, 1947; Sporn 1955, 1958, 1965) and in natural conditions (Hudson 1977); additional field data are provided by Pianka & Pianka (1970). Clutch size varies from 3 to 10 with a mode of 8 (N = 37; Pianka & Pianka, 1970). Dates of egg deposition by 25 females were as follows; late October (6), early November (8), late November (5), early December (3), and late December (3). In Mandurah, egg laying by captive *M. horridus* was recorded in October and November. White (1947) reports egg laying by *M. horridus* around Coorow from late October to December, and Hudson (1977) reports egg laying in the Whyalla Fauna and Reptile Park, (South Australia), between 30 October and 7 November. Female N laid its eggs a month earlier than Pianka & Pianka's (1970) record for desert specimens, and female Q deposited its clutch a fortnight earlier, lengthening the estimate of the duration of the egg-laying season for desert specimens.

All three female thorny devils chose the southern base of the same sandridge for their nesting burrows, suggesting that this exposure may confer some unknown advantage. We do not know whether hatchlings share the cost of tunnelling out from the nest chamber, or whether the first hatchling does all the work. Sporn (1955, 1965) also reports that neonates emerge from their nesting chamber through a single hole. The lack of egg shells in the nesting chamber suggests that the neonates ate their egg cases. Sporn (1958) also reports no egg cases in the nesting burrow of hatched *M. horridus*. We are

unaware of any evidence to suggest that any other species of squamate consume their own eggshells following hatching; this could add substantially to hatchling body mass and provide neonates with calcium and other materials for early growth. Another unique feature of the nest of *M. horridus* is the large nest chamber, as was also reported by White (1947) and Sporn (1955). We know of no other squamate that lays its eggs into a large air filled chamber that it has excavated. White (1947) reports the entrance tunnel to be about 44 cm with a chamber of approximately 17 cm by 10 cm. Sporn (1955) reports a tunnel of approximately 47 cm leading to a nest about 24 cm below the surface. The placing of the eggs in a chamber, rather than surrounded by sand, may facilitate consumption of eggshells upon hatching. Eggshells of other reptiles being surrounded by sand or soil presumably could not easily be eaten by the hatchling.

Sporn (1965) summarised incubation periods for captive *M. horridus* hatched at Mandurah as ranging from 90 to 132 days, with a mean of 115 days. Hudson (1970) reported that *M. horridus* took between 104 and 110 days to hatch. The 123-124 and 127 incubation days reported for females N and Q respectively are within the range reported by Sporn (1965).

The introduction of a male *M. horridus* into an enclosure that contained a single female in mid-September resulted in a series of attempts by the male to copulate with the female. For a period of 10 to 60 minutes, neither lizard appeared to acknowledge the other's presence. The male then suddenly moved in the direction of the female and rapidly bobbed its head a number of times. When the female remained stationary, the male attempted to mount her from behind, with one hind leg on the ground. The unreceptive female threw the male off her back by a quick longitudinal roll, then moved away from the male.

**Acknowledgments:** We thank Edith Cowan University for financial support that enabled us to undertake this project. The University of Texas at Austin also helped finance this study. All experimentation was done with the approval of the Animal Ethics Committee of Edith Cowan University and lizards were caught with the approval of the Department of Conservation and Land Management.

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